ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1. 1902.

I.—PASPALUM DILATATUM, AN AMERICAN FODDER-GRASS.

Paspalum dilatatum, Poir., commonly known as "Hairy-flowered Paspalum," "Large water-grass," and, in Victoria, as "Leichardt grass," is indigenous in Brazil, Uruguay, and the Argentine Republic. According to Doell (*Flora Brasiliensis*) the plant has also been collected in Chile, but it is improbable that it is native on that side of the Andes. It is widely distributed in the Gulf States of North America, and is said to be one of the commonest species in the prairie region of Louisiana. It is found along ditch-sides and in other wet places in Tennessee and the littoral States from South-eastern Virginia to Florida, and westwards to Texas. Throughout this region, in which it is probably naturalised, it is a highly valued fodder-plant, and is widely planted in favourable situations.

Introduced into Australia by Baron F. von Mueller, its cultivation was commenced in the Richmond River district, New South Wales, in 1892. Thence it has spread to Queensland, Victoria, and Western Australia, and is now regarded as one of the best fodder-grasses in the country. From the Wollongbar Experimental Farm (Richmond River) seeds were sent to India, and the grass has been grown, with but moderate success, in the fuel and fodder reserves at Nagpur, though it promises to do well in the plains of the Central Provinces. The Agricultural and Horticultural Society of India report (*Annual Report*, 1900) that it grows vigorously at Mussoorie, in spite of "intense cold." The roots of a clump grown there measured over $3\frac{1}{2}$ feet in length. In the *Annual Report* of the Superintendent of the Royal Botanic Garden, Calcutta, for 1900–1901, occurs the following statement :—

"The use as a fodder-grass of *Paspalum dilatatum*, a native of America, which has proved very valuable in Australia owing to

1375 Wt 89 3/06 D & S 29 24020 A

its drought-resisting qualities, has led to its introduction to India on as large a scale as possible. Finding that very little seed could be spared by Australian correspondents of the Garden, the assistance of the Agrostologist to the Department of Agriculture of the United States was invoked. Thanks to the kind help of that officer, a large supply of the seed of this grass was obtained from America, and has been freely distributed throughout India."

The attention of South African agriculturists has recently been directed to the valuable properties of *Paspalum dilatatum* as a fodder-grass. A few plants were found at Newcastle (Natal) by Mr. J. Medley Wood in 1897, though when or through what channel introduced is not known. It is now found to be fairly abundant in the neighbourhood of Newcastle, and, in all probability, numerous patches occur in various parts of the Colony. In New Zealand it has been in cultivation since 1896, at the Momohaki Experimental Station, where it has produced a yield of grass equal to 9½ tons an acre. It is, however, killed by the cold of the New Zealand winter. The plant is found also, as a weed or escape, in Porto Rico, Mauritius, and the Straits Settlements.

This grass is a coarse leafy perennial, with a tendency to grow in clumps ; it attains a height of 2 feet and over—in favourable situations even reaching 6 feet. It thrives best upon rich moist land, and grows very luxuriantly in black alluvial soils. It is said to succeed also in sandy soils, even when a considerable proportion of salt is present. Being a very deep-rooted grass it has a remarkable capacity for withstanding conditions of drought. In Western Australia it flourishes in poor mountain soils. When once established it withstands frosts, if not continuous, and, in Victoria, is successfully cultivated up to an elevation of 2,000 feet. It is, in fact, admirably suited for cultivation in tropical and sub-tropical climates.

As a permanent pasture grass, *Paspalum dilatatum* holds a high position among tropical grasses. Notwithstanding its luxuriant habit, its tissues are soft and succulent, and contain only a normal proportion of woody cells. There is " no part of it, from the crown to the head, that stock will not eat." When well-established it endures long periods of drought without injury. It starts its new growth early in the spring, and continues to grow vigorously until late autumn. It thus affords excellent late summer and autumn feed. Its permanence on suitable soil is undoubted, for at Wollongbar, after four years' grazing, " the paddocks are still improving, and giving an increased quantity of feed." (H M. Williams, in *N.S.W. Agricultural Gazette*, 1898.) Excellent results are obtained by using *Paspalum dilatatum* as a constituent of a mixed pasture, which contains also Cocksfoot (*Dactylis glomerata*) or other grass which makes growth in the winter, at which time the Paspalum is at its worst. The pasture should be allowed to seed during the second year, that the Paspalum may distribute its seed, as it spreads very slowly from the roots. For dairying purposes, Paspalum is of great value, as it has great milk-producing properties.

For hay, this grass is rather coarse, and usually has a bad colour when dry. It is, however, of excellent quality, and the yield is very large. A sample grown on the Wollongbar Experimental

Farm gave the following results on analysis (F. B. Guthrie, in *N.S.W. Agricultural Gazette*, 1897) :—

Moisture	10·55			
Albuminoids ...	10·31	soluble	1·38	
		insoluble	8·93	
Digestible fibre ...	29·96			
Woody fibre	27·95			
Ash	6·37	soluble	4·32	
		insoluble	2·05	
Amide compounds, Chlorophyll, &c.	14·86	total nitrogen ...	2·66	
		amide nitrogen ...	1·01	
	100·00			

This analysis compares very favourably with that of ordinary English hay, and shows a larger proportion of digestible and nourishing material. In deeply worked rich soils at least three crops may be obtained per annum when the plant is well established. On the Richmond River (N.S.W.) Government Farm, in one year, 14 tons per acre were obtained on the first cutting, 8 to 10 on the second, after which a third crop of 6 to 7 tons was gathered—making a total yield of 28 to 31 tons per acre.

An analysis of a sample of the crop grown on good cultivated land on the creek flats of the Queensland Agricultural College, and cut on April 22nd, 1901, compares rather unfavourably with the foregoing. The yield of grass in this crop was 10·525 tons per acre, and of hay (air-dried grass), 2·858 tons per acre. The analysis of the hay yielded the following figures (J. C. Brünnich, F.C.S., in *Queensland Agricultural Journal*, 1901, pp. 245, 246) :—

Moisture	10·72			
Albuminoids ...	4·81	soluble	0·96	
		insoluble	3·85	
Digestible fibre ...	26·97			
Woody fibre	34·45			
Ash	10·14	soluble	6·06	
		insoluble	4·08	
Amide compounds, Chlorophyll, fat, &c.	12·91	total nitrogen ...	0·882	
		amide nitrogen ...	0·112	
	100·00			

There is a remarkable difference in nitrogen yield between this sample and that analysed by Mr. Guthrie. The apparent inferiority of this crop is attributed by Mr. Brünnich to the facts that the grass was over-ripe when cut, and had been grown in exceptionally dry weather, and on a larger scale than the Wollongbar sample.

From the time that the first seeds in each spike are mature, the ripening of the whole spike occupies about three weeks. In consequence, the harvesting of the seeds is a matter of some difficulty. Those collected during the first few days of ripening are of better quality than those shed later, for a much larger proportion of them are mature, and will germinate. To produce a good pasture on well-prepared land, 5 to 8 lbs. of seed per acre is recommended as being sufficient. The plant should be allowed to shed its seed

until the growth is established. The best time for sowing is in the beginning of the warm season, just before the rains are expected. Under favourable conditions the seeds germinate in 18 to 21 days. For quick results, and also on account of the difficulty of obtaining reliable seed, the planting of "roots" is recommended, particularly when a mixed pasture is being formed. At Wollongbar the "roots" are planted 4 or 5 feet apart, each way, and the ordinary grass or clover seeds are afterwards sown in their proper seasons.

Sets for planting can be obtained from the Wollongbar Experimental Farm, Richmond River, New South Wales; seeds are supplied by Messrs. Law, Somner & Co., 139–141, Swanston Street, Melbourne.

II.—GINSENG IN CHINA.

(*Aralia quinquefolia.*)

Aralia quinquefolia grows in Japan, Corea, and Manchuria, also in Saghalien, in the mountains of China from north to south, in the Himalaya, and in a part of North America which comprises the East of Canada and the Temperate and Eastern United States. In this extensive area can be recognised a number of varieties differing in the leaves and rhizome, or in the length of the peduncle; and it would seem that they differ also in medicinal properties.

China is almost the only market for the drug. There, where medicine works hand in hand with the occult sciences, where the efficacy of the stuff commonly sold to heal is not inquired into, Ginseng, discarded after trial in Europe and America, remains the panacea for almost all ills.

American Ginseng is grown for export to China. It was the subject of a notice in an earlier issue (*K. B.*, 1893, p. 71), and an excellent account of it by G. V. Nash, is published as *Bulletin No.* 16 by the United States Department of Agriculture, Division of Botany. We shall not concern ourselves with it except in its relation to China.

A mature plant of Ginseng consists of a stem 1–2 feet high, bearing at the top an umbel of inconspicuous greenish-yellow flowers, and towards or above the middle a whorl of four or five compound leaves. The leaflets are 5–7 in number and are lanceolate or lanceolate-obovate or obovate, rather regularly serrate, acuminate, and with white bristles sparsely scattered along the veins.

The stem which bears the leaves and flowers is renewed every year from an underground rhizome, to which in some forms (probably in all at one period of the life of the plant) is attached a fleshy root. In the American and Manchurian varieties the root is large and the rhizome generally very small, but in others the rhizome is large and fleshy. Both rhizome and root afford commercial Ginseng.

The plant is of long duration. The rhizome elongates year by year, though the growth may be but little, and the old fleshy root may give place to a fresh one; it may branch, or may give rise to two or three fleshy roots, according to the vigour of the plant. But these features vary in the different varieties which will be

described ; and branching is more common where the plants are well nourished, as in cultivation. One old rhizome preserved in a museum in America has 65 scars of annual shoots.

Fleshy roots are sometimes human in form, a likeness not hard to increase by a little dexterous snipping. Such roots are the most valued in China, and sell at an enormous price. A Chinaman who cannot afford the long figure necessary for these is content to purchase rhizomes, and the poorer put up with scraps, classified in the *Chinese Customs Reports* as "Beards, Clippings, &c."

The rhizome may be as thick as the little finger, or even thicker ; when gathered in the height of summer it shrivels in drying and becomes much wrinkled ; sometimes it closely resembles that of *Polygonatum officinale* (Solomon's Seal) ; sometimes it is swollen at intervals.

We recognise the following varieties of *Aralia quinquefolia* ; for convenience a dichotomous key for them is given :—

Peduncle hardly exceeding the petioles ; scale at the base of the annual shoot papery ; American plant ... ... type.

Peduncle conspicuously exceeding the petioles ; scale at the base of the annual shoot sometimes fleshy ; Asiatic plants :

Larger leaflets so narrowing towards the base that the sides are somewhat rounded :

Broadest part of the larger leaflets at or above the middle :

Rhizome very short ; root fusiform ... ... var. Ginseng.

Rhizome long, creeping, with fusiform roots attached or not (?) :

Leaflets with few setae, very conspicuously shining ; petiolule $\frac{1}{8}$–$\frac{1}{2}$ in. long, sometimes longer var. repens.

Leaflets with plentiful setae, usually less shining ; petiolule mostly $\frac{1}{2}$–1 in. long :

Leaflets, when dry, hardly translucent, large ... ... var. major.

Leaflets, when dry, translucent :

Setae very abundant, leaflets to $4\frac{1}{2}$ ins. long ... var. pseudo-Ginseng.

Setae less abundant, leaflets to $5\frac{1}{2}$ ins. long ... var. notoginseng.

Broadest part of the larger leaflets near the base ... ... var. angustifolia.

Larger leaflets, so narrowing towards the base that the sides are straight... var. elegantior.

Description of the Varieties.

Aralia quinquefolia, *Decne. & Planch. in Rev. Hortic.*, sér. iv., iii., p. 105, (typus ad varietates discriminandas ex parte descriptus). *Foliola* majora late obovata, conspicue acuminata (acumine $\frac{1}{4}$–$\frac{1}{2}$ poll. longo), basi rotundata vel obtusissima, margine serrata, dentibus majoribus iterum minute serrulatis, $3\frac{1}{2}$–$4\frac{1}{2}$ poll. longa, $1\frac{3}{4}$–2 poll. lata, lævia, subnitida. *Pedunculus* petiolis fere æquans vel rare sublongior; *Umbella* singula. *Radix* crassa fusiformis; *rhizoma* sæpe breve.—*Kew Bulletin*, 1893, p. 71; *Panax quinquefolium*, Linn.; *D.C. Prod.*, iv., p. 252; *Bot. Mag.*, t. 1333; Barton, *Med. Bot.* (1818), ii., t. 45, p. 191; Nees, *Ic. Pl. Med. oder Sammlung Off. Pfl.* (1828) fasc. 5, t. 15; Bigelow, *Med. Bot.*, ii., t. 29, p. 82; Butz in *Pennsylvania Dept., Agric. Bull.*, No. 27, pp. 8–13; Nash in *U.S. Dept., Agric. Bot. Bull.*, No. 16, pp. 5–12; *P. Ginseng*, Spach, *Hist. Nat. Végét.*, t. 39.

Hab. United States and Canada.

Var. **Ginseng**, *Guide to Kew Museum*, *No.* 1 (1886), p. 87. *Foliola* majora elliptico-oblonga, acuminata (acumine ad 4 lin. longo), basi rotundata vel obtusissima, margine regulariter serrata, dentibus parvis, ad $3\frac{1}{2}$ poll. longa, ad $1\frac{3}{4}$ poll. lata, setis paucis ad venas majores obsita, vix nitentia; petiolus ad $\frac{3}{4}$ poll. longus. *Pedunculus* petiolis cum laminis longior. *Umbella* speciminibus visis singula. *Rhizoma* perbreve; *radix* fusiformis.—*Kew Bulletin*, 1892, p. 107. *Aralia quinquefolia*, A. Gray, in Mem. Amer. Acad. Sc., n.s., vi., p. 391; Hemsl. in Journ. Linn. Soc. Bot. xxiii., p. 338. *Panax quinquefolium*, var. *Ginseng*, Regel & Maack ex Regel in *Gartenflora*, 1862, p. 314, t. 375; *P. quinquefolium* var. *coreense*, Sieb., in *Verhandl. bot. Genootsch.* xii.; *Panax Ginseng*, C. A. Meyer in *Bull. Phys.-Math. Acad., St. Petersb.*, i., 1843, p. 340; Franchet and Savatier, *Enum. Fl., Jap.*, i., p. 192 *in nota*; *Useful Plants of Japan* (published by Agric. Soc., Japan, 1895) p. 115, t. 431; *Honzo-zufu*, vol. i., figs. 5, 6 and 8; *Somoku-zusetsu*, vol. iv., fig. 45.

Hab. Manchuria, and cultivated in Japan and Corea. Usuri, *Maack;* Chang-pei-shan, between Mukden and Kirin, *James.*

"Ninzin," the Japanese name, is of very wide application. *Sium Ninsi* gets its specific name from it and many Umbelliferæ, among them the carrot, have it in combination with some epithet for their Japanese name.

Var. **repens**, *Burkill. Foliola* majora elliptico-ovata vel late obovata, acuminata (acumine ad $\frac{1}{2}$ poll. longo), basi subacuta. margine regulariter serrata vel plantarum japonicarum forsan vix maturatarum irregulariter argute apicem versus grosse serrata, dentibus iterum serratulatis, ad 5 poll. longa, ad 3 poll. lata vel raro multe angustiora, lævia, nitentia; petiolulus brevis. *Pedunculus* petiolis cum laminis, saepe bis longior. *Umbella* singula vel umbellis lateralibus parvis consociata. *Rhizoma* repens, elongatum; *radicem* crassam (*teste scriptorum*)—*Panax repens*, Maxim. in *Bull. Acad., St. Petersb.*, 1868, p. 64; Franchet and Savatier, *Enum. Pl. Jap.*, i., p. 192; *Useful Plants of Japan* (published by Agricultural Society, Japan, 1895), p. 114, t. 430. *Honzo-zufu*, vol. i., fol. 7; *Somoku-zusetsu*, vol. iv., fig. 47.

Hab. Corea and Japan. Japan : Mt. Yanazu, and Hakone, *Collector for Imperial Univ., Tokyo;* Mambetisu, *Faurie;* Osorezan, *Faurie;* Hakodate, *Maximowicz.* Corea : Tsusima island, *Wilford*, 825.

This is the Tochiba-ninzin of Japan ; possibly it exists in two forms.

Var. **major**, *Burkill. Foliola* majora fere elliptica vel elliptico-ovata, acuminata (acumine fere ad 1 poll. longo), basi rotundata vel obtusa, margine regulariter serrata, dentibus nec semper serratulatis, ad 10 poll. longa, ad 4 poll. lata at tamen vulgo 5–6 poll. longa, 2–2½ poll. lata, setis ad venas obsita, nec nitentia. *Pedunculus* talis ut in var. *repente* sed longior, ramosus, floribus numerosis. *Rhizoma* repens, frequentius late repens, nunc cicatricibus conspicue notatum, nunc nodulosum ; *radicem* crassam non vidi.

Hab. Central China. Hupeh, Ichang, *A. Henry*, 932 ; Chien shih, *A. Henry*, 5396c ; Hsingshan and Fang, *A. Henry*, 5396g and s ; Kwei, *A. Henry*, 7728 ; Szechuen, N. Wushan, *A. Henry*, 7121.

Var. **pseudo-Ginseng**, *Burkill. Foliola* majora elliptico-obovata vel obovato-lanceolata conspicuissime acuminata (acumine ad ¾ poll. longo), basi subacuta, marginibus argute serrata, dentibus serrulatis, ad 4½ poll. longa, ad 1½ poll. lata, setis conspicue obsita, vix nitentia, infra pallida, translucentia. *Pedunculus* petiolis cum laminis æquilongus 1-umbellatus. *Rhizoma* breve ; *radix* fusiformis, lignosa. — *A. pseudo-Ginseng* Benth. ex. C. B. Clarke in *Hook. fil. Fl. Brit. Ind.*, ii., *p.* 721 (*in part*). *Panax pseudo-Ginseng*, Wall. *Pl. As. Rar.* ii., 30.

Hab. Nepal. Shevpore, *Wallich*, 3730.

Var. **notoginseng**, *Burkill. Foliola* majora obovata, conspicue acuminata (acumine ½–⅔ poll. longo), basi subacuta, margine argute serrata, dentibus serrulatis, ad 5½ poll. longa, ad 2 poll. lata, setis ad venas obsita, nitentia, translucentia. *Pedunculus* foliis longior, 1-umbellatus, floribus numerosis. *Rhizoma* ad formam varietatis *repentis* tendens, crassum ; *radicem* fusiformem in planta perparva vidi.

Hab. South China. Yunnan, mountains near Mengtze, 5,000 ft., *A. Henry*, 11,407 ; Szemao, 4,500–6,000 ft., *A. Henry*, 12,259, 12,259a.

Var. **angustifolia**, *Burkill. Foliola* majora lanceolata conspicuissime acuminata (acumine 1 poll. longo), basi rotundata vel angustata vel subcordata margine minute serrata, ad 5½ poll. longa, vix 1 poll. lata, setis sparsim obsita nec nitentia infra pallida ; petioluli conspicui. *Pedunculus* petiolis cum laminis æquans. *Umbella* plerumque singula. *Rhizoma* repens vel crassum vel nodulosum.—*A. pseudo-Ginseng*, Benth. ex. C. B. Clarke in *Hook. fil. Fl. Brit. Ind.* ii., *p.* 721 (*in part*).

Hab. Sikkim, Bhotan and Khasia Hills. Sikkim, Lachen, 9–12000 ft., *Hooker ;* Sundukphoo, 10000 ft., *C. B. Clarke*, 35,685d ; Neebay, 7000 ft., *C. B. Clarke*, 25,338 ; Buckeen, 7,500 ft., *C. B. Clarke*, 25,301a ; Rungbee, 5000 ft., *C. B. Clarke*, 12,336, 12,411b ; Kula Panee, *Hooker*, 1,320 ; Bhotan, *Griffith*, 2,077, 2,658 ; Khasia, 5000 ft., *Hooker.*

Var. elegantior, *Burkill*. *Foliola* majora oblanceolata, acuminata (acumine $\frac{1}{2}$ poll. longo), basi acuta, marginibus argute serrata, dentibus $\frac{1}{2}$ lin. longis, ad $3\frac{3}{4}$ poll. longa, ad $1\frac{1}{8}$ poll. lata, infra pallida. *Pedunculus* petiolis cum laminis ter longior. *Umbella* plura, terminalis magnus. *Rhizoma* longe repens, nodulosum.

Hab. Central China. Hupeh, Fang and Hsingshan, *A. Henry*.

Of these varieties, var. *Ginseng* is the source of Manchurian Ginseng, var. *repens* of the larger part of Japanese Ginseng, and var. *notoginseng* of that of South China. The rest, excepting the American type, are of no known economic value.

Nothing of value to us is to be gained by an examination of the botanical works published in Europe before A.D. 1700. Ginseng root was known by its great repute in China, but the leaves and flowers of the plant were generally quite incorrectly represented. The first important contribution was made by the Jesuit missionary Jartoux, who in 1709 was employed by the Emperor of China to make a map of his domains. This Emperor, it may be added, was a Manchu, and his house first sat on the throne of China in 1644, having conquered it from Manchuria. Part of the royal revenue of the new Manchu emperors came from a monopoly of the Ginseng trade, the emperor reserving to himself the right of trading in the Manchurian drug. Jartoux describes his meeting with an army of 10,000 Tartars collecting Ginseng for the emperor (*Phil. Trans. Roy. Soc.*, (*abridged*) vi., p. 58). "These herbarists," he says, "carry with them neither tents nor beds, everyone being sufficiently loaded with his provision, which is only millet parched in an oven. So that they are constrained to sleep under trees, having only their branches and barks, if they can find them, for their covering." Each collector was employed on the condition that he "should give His Majesty two ounces of the best, and that the rest should be paid for according to its weight in fine silver. It was computed that by this means the emperor would get this year, 1709, about 20,000 Chinese pounds of it, which would not cost him above one-fourth part of its value."

Jartoux adds that the district producing the Ginseng was fenced off and guarded by a patrol, lest the Chinese should break in on the monopoly, "their greediness after gain inciting them to do so"; and that writers who affirmed that Ginseng grew elsewhere in China were mistaken. In the last statement he must have been in error, for 60 years after it was reported from South China by another traveller—Osbeck (*Voyage to China*, i., p. 223).

The royal monopoly does not exist now; but a temporary prohibition against the importation of American roots made some sixty years later, and the present cultivation in the Royal Hunting Park north of Pekin of a certain very highly priced kind, are probably the outcome of it.

Jartoux strangely prophesied the discovery of Ginseng in Canada; he described its habitat in China accurately, and added, "all this makes me believe that if it is to be found in any country in the world, it may be particularly in Canada, where the forests and mountains, according to the relation of them who have lived there, very much resemble these here." A French missionary,

Sarasin, ascertained that it grew near Quebec, but though he found it to be used a little medicinally by the Indians, it had no extraordinary reputation with them.

From Canada the French of Quebec began to export it through France to China. The profits at first were very great, and Indian labour, save for the collecting of Ginseng, became unobtainable about Quebec. These profits led to the discovery of the root over some of the States of New England, and to the exportation taking large proportions. The usual exhaustion of the supply followed; poor roots were gathered, until a miserable cargo sent from Bordeaux to China found no purchaser, and for the time the trade terminated about 1810. When later the trade was renewed American roots took the lowest price and continue to do so.

Ginseng is a tonic and stimulant and some attribute to it aphrodisiac properties, but these are doubtful. The Chinese believe that it prolongs and sustains life more than any other drug.

It has been tried in Europe and North America, and almost discarded except as a demulcent. Bigelow says of it (*Med. Bot.*, ii., p. 82) that in his time it was sold as a masticatory, and adds, "it is certainly one of the most innocent articles for this purpose. Its place in medicine is near liquorice, but it is not active."

Undoubtedly European opinion is largely based on experiments with American roots. It is not clear that the Asiatic root is as inert as the North American. Some writers say it is more active, which seems possible, but an exact statement cannot be made. Possibly the most valued kinds are really less inert than others.

The cultivation of Ginseng is very similar everywhere. The necessary shade has to be provided either by planting under trees, or by some form of covering. Butz (*op. cit.*) at p. 21 figures the lattice shading used in the United States; and for the methods in vogue in North America reference can be made to his article, and to the *Kew Bulletin* (1893, p. 71).

The method in use in Japan is described by Fesca in *Beiträge zur Kenntniss der Japanischen Landwirthshaft*, ii., pp. 333–336. The plants are shaded throughout the summer by means of a thatched straw roof.

Henry, in a letter to Kew, describes the cultivation in South China as follows:—

"My native collector procured the specimens sent forward under Nos. 11,407 and 11,407A in the mountains lying about 50 miles south-east of Mengtse. Here the cultivation of the plant is carried on in small plots in clearings of the forests by some of the peculiar aborigines named *Yao-jen*. The seeds are sown about 5 inches apart in carefully prepared soil. In the second year the young rhizomes, from which the leaves and rootlets have been cut off, are transplanted to other plots; and in the fourth year the rhizomes are dug up and sun-dried. The growing plants are protected from the glare of the sun by rude stagings made of vertical stakes across which are laid leafy branches of trees. This mode of cultivation under partial cover is also used by the Chinese in Hupeh in the case of huang-lien (*Coptis Teeta*, Wall.), another valued drug-plant.

"The specimens sent include both wild and cultivated plants from the same neighbourhood ; but my native collector thinks that the wild specimens are only escapes from cultivation. In the mountains, which I visited, all around Mengtse, I never met with this form of Aralia growing wild.

"In Hupeh and Szechwan I found in the mountains growing wild several forms of Aralia of the section *Ginseng*, to which the natives gave the name of *San-ch'i*, and these forms were referred at Kew to *Aralia quinquefolia*, Planch. et Decne., and *Aralia repens*, Maxim., but it is possible they may all belong to only one species. *Aralia bipinnatifida*, C. B. Clarke, also occurred, but only in the highest parts of the mountains ; and it seems to be a well-marked distinct species. No cultivation of *San-ch'i* occurs in Hupeh or Szechwan ; and the rhizomes of these wild plants were of no value commercially. *Shan-yeh*, leaves of a Panax, exported from Hankow as a drug, is however derived from these wild forms, but it is of no importance, the quantity in commerce being most trifling.

"It is remarkable that *Ginseng* and *San-ch'i*, perhaps the two most esteemed drugs in China, one occurring in the extreme north, the other in the south, should be so closely allied botanically.

"With regard to the name *San-ch'i*, while it is primarily given to the Kwangsi-Yunnan drug, yet several other plants are often spoken of under the name of *San-ch'i* or *t'u-san-ch'i*. These plants are cultivated in pots and are of no particular value as medicines in the eyes of the Chinese. They are *Gynura pinnatifida*, DC., *Sedum Aizoon*, Linn., and in Formosa, also, *Panax fruticosum*, Linn.

"Augustine Henry.

"Szemao,
"12th July, 1898."

The crop requires 3–4 years growth to reach the right age for profit. This period is the same in North America, Japan and China. The plant is always grown from seed, and the first leaves of the seedlings may be much more cut than those of the mature plants. This is especially the case in var. *notoginseng*, and in it the very young rhizome probably produces two or three shoots in the first year.

The great demand which has caused so much extinction of the plant in the United States has caused the same in Asia. In the time of Jartoux it seemed to occur nearer Pekin than now (Bretschneider, *Early Eur. Res.*, p. 19). Legislation has been resorted to in both places. In North America the State of Virginia enacted (1875–76) that no Ginseng should be dug between March 15 and September 15 ; in Canada the law determined the forbidden period to extend from January 1 to September 1 ; other laws are in force elsewhere. In Corea, (*fide James*), no Ginseng may be sold before a certain date, and he describes the way in which the wild roots are sought for.

The structure of the "root" in section is not dissimilar to that of Chærophyllum, in which the large quantity of parenchymatous xylem makes the structure fleshy ; in the pith and elsewhere are star crystals. The outer tissue of the bark is torn and full of

A.D.Mulla, del

Microtœna cymosa. Prain.

crystals and near the periphery are a few resin (?) canals. The latter are in such a position that they may be removed by the scraping which the root often undergoes in preparation for the market.

Adulteration is not uncommon. Rootstocks of *Centaurea*, *Adenophora*, *Angelica*, *Platycodon*, *Rehmannia*, etc., are used in the East, *Campanula glauca* being said to be common in Japanese Ginseng. *Sium Ninsi* was formerly confused with Ginseng, perhaps, because it was offered as a substitute.

Roots of Ginseng once used for making an extract are not uncommonly dried and fraudulently sold for good roots.

An enquiry into the medicinal value of the more highly priced Ginsengs may prove of some scientific interest. The sums given, *e.g.*, three hundred shillings for one single root, would seem incredible were the drug altogether inert.

When Louis XIV., of France, received envoys from Siam, part of the royal gift they brought was in Ginseng.

ISAAC HENRY BURKILL.

III.—KHASIA PATCHOULI.

(*Microtœna cymosa*, Prain.)

With Plate.

Commercial Patchouli is derived from a species of *Pogostemon* [*Kew Bulletin* for 1888, p. 73]. This plant is sparingly grown in India, and is more generally cultivated in the Malay Peninsula and Archipelago. It also occurs in the Philippines; whether it be cultivated there is not clear. It is, moreover, possible that more than one species of *Pogostemon* may be cultivated; this point it is hoped may be dealt with in a future note.

In Malaya the cultivation of Patchouli is largely in the hands of Chinese settlers. This fact may possibly explain a suggestion which has been made that China is the original home of the Patchouli-yielding *Pogostemon*. However, no *Pogostemon* with the Patchouli smell has hitherto been reported from China.

There is, however, no reason why Chinese settlers in Malaya should not be familiar with Patchouli-yielding plants, for the Patchouli odour is not confined to the genus *Pogostemon*. It is associated with more than one species of the genus *Microtœna*, the majority of which are natives of China. One species, *Microtœna robusta*, Hemsley, a native of Szechuen, where, according to a note by M. Farges, it is known as *Chi-kiang-tsao*, is employed on account of its odour much as the Patchouli imported from Malaya is used in India. Another species, *Microtœna cymosa*, Prain, of which a figure is here given, appears to be similarly used in South-Eastern China (Kwang-tung) and in various parts of Indo-China. There is also a solitary record of its occurrence in Java. It has been already referred to in the *Kew Bulletin* [1888, p. 74] under the provisional name *Plectranthus Patchouli*.

An examination of the herbarium material of this species shows that it was first collected in the Eastern Naga Hills, Assam, by Griffith about 1839, was shortly afterwards collected by Jenkins

in some part, not specified, of Assam, and was again collected, in 1845, by Zollinger, in Java. No one appears to have met with it again till Clarke obtained it in 1871 in the Khasia Hills, Assam; Clarke's field note says "cultivated in Khasia and said to be the true Patchouli." In 1884 the species was collected in Kwang-tung by B. C. Henry, and in 1885 it was met with by Clarke in Manipur, a small State situated between Assam and Burma. Since then it has been obtained in Tonkin by Balansa, in the Burmese Shan States by General Collett, and in the Shan States of Siam by Lord Lamington.

The small local demand for Patchouli in Calcutta is said at one time to have been met by supplies from the Khasia Hills. The Khasia Patchouli has, however, been replaced in the Calcutta market by the Malayan article. Clarke's note of 1871 and a subsequent note by Mann, in 1887, of the occurrence of *Microtæna cymosa* as a cultivated plant in the Khasia Hills shows that the practice of growing it had long survived the loss of an outside market. The plant is not wild in the Khasia Hills, and Clarke has noted that even in Manipur he suspects that it may have been originally planted. This suspicion extends not only to the Assam records of Griffith and Jenkins, but to the Shan records of General Collett and Lord Lamington, and to one out of three records of the plant from Tonkin. There is hardly room for doubt that Zollinger's record from Java points to *M. cymosa* as an introduced species in that island; during the past 60 years it has not again been reported from Malaya.

In two Tonkin localities recorded by Balansa, the nature of his notes and the character of his specimens point to the plant being there a wild species; the same is true of some of the specimens collected in Kwang-tung by B. C. Henry, and subsequently by Ford. There is, therefore, hardly room for doubt that the isolated record of the Khasia Patchouli from Java may be explained by its introduction to that island by Chinese settlers, and there are good grounds for supposing that its occurrence in the Shan country and in Assam is due to its having spread thence as a cultivated plant from South-Western China or Tonkin.

D. Prain.

IV.—TOBACCO CULTIVATION IN SOUTHERN SIAM.

The following notes on the cultivation of Tobacco in the Northern Siamese Malayan States of the Malay Peninsula were made by Mr. W. W. Skeat during the Cambridge exploring expedition in 1900. Tobacco has never been successfully cultivated in the Southern Malay States, probably on account of the inferiority of the soil.

At a village near Perlis I made enquiry about the local methods of growing tobacco.

There are two kinds of tobacco generally grown here :—

(1.) Tembakau Chĕnak.

(2.) Tembakau Lērek.

The Tembakau Chĕnak, which is said to derive its name from a village in "Ulu Patani," has the smaller leaf of the two, but it

can most easily be distinguished from Tembakau Lērek by the fact of the latter having two small lobes or stipules (?) (or "ears," as the Malays call them) close to the stem at the base of the leaf. The leaf of Tembakau Lērek is said to run to a full hasta (about 18 inches) in length by about 8 inches in breadth, whereas the leaf of Tembakau Chĕnak runs only to about 12 inches in length, with a breadth of 6 inches. The former would appear to be but little inferior to the tobacco grown by the Bataks in the neighbourhood of Deli, in Sumatra, where I am informed that a good average leaf to look for in native gardens would be, say, 18 inches by 12 inches (or a little less). In Sumatra, however, the natives have had the advantage of being able to pick up ideas for the improvement of their tobacco from the well-known tobacco plantations of the Europeans at Deli, whereas the Peninsular Malays have had nothing but the light of Nature to assist them. On the whole, the Malays of Perlis prefer the Tembakau Chĕnak or smaller-leaved variety, as they say it "turns red" (*i.e.*, ferments) more quickly than the other.

The seeds are sown in small cylindrical pots, which are made of rolled-up screw-palm leaves, and which are deposited upon a carefully prepared bed or nursery. These rudimentary pots measure about 3 inches across, and have no bottom. Their main use is no doubt to keep the earth from being too much shaken away from the roots at planting out.

The young plants, as soon as they are big enough for transplanting (usually when about 20 days old), when the leaf is a palm's-breadth across, are put out in a small and carefully fenced clearing and allowed to grow for three months, at the end of which time the first leaves should be ready for picking. Both kinds are topped just before they fruit, but a single shoot is often allowed to grow again when necessary in order to provide seed for the next year's crop. The bigger sort (Tembakau Lērek) requires to be thoroughly manured twice (with bullock and fowl dung), but the Tembakau Chĕnak only requires a single manuring, which is given it when it is planted out.

Only one crop a year is planted, and the yield is reckoned as follows :—

10 plants of T. Chĕnak will only yield 1 chupak ;

16 trees of T. Lērek will yield 6 katis (or a gantang less 4 tahils, as it is usually reckoned).

The sale for the leaf is only local, and both varieties fetch the same price as per weight, *i.e.*, 50 cents per gantang ; whereas 1 kati of Deli or Langkat tobacco is sold here by the Chinese for 75 cents.

The leaves are picked in the early morning, and are then washed, dried, and put aside in a dry shady place until the evening, when they are piled and pressed for the sweating process. Care must, however, be taken to see that they are fairly dry before sweating, as otherwise they will go bad (jadi bohuk) and become unfit for use.

The leaves of both varieties are allowed to ferment as follows :—

One hundred leaves of tobacco are carefully piled upon each other, and are then deposited between a couple of stout leaf-wrappers. Each leaf-wrap consists of a banana leaf and an areca

palm leaf, the banana leaves being placed outside. The pile of leaves thus composed is rolled tightly up in an ordinary Malay sleeping-mat (in order to keep in the heat and so promote "sweating") and put aside for three or four nights. It is then unrolled and inspected, and when any leaves that have turned red (*i.e.*, fermented) are observed, they are removed from the pile and the remainder rolled up again and put back till the next day, when they are once more examined, the process being continued until the fermentation of all the leaves is complete.

The fermented or "red" leaves when extracted from the pile are sliced off into very fine shreds or filaments by means of a special (tobacco-cutting) apparatus and are then exposed to the sun upon a frame until they are thoroughly dry, when they are tightly packed in cylindrical receptacles (measuring about 12 inches in depth by 8 inches across, and made of screw-palm leaves), when they are ready for sale if required.

In Ulu Kelantan the process was similar, the following rules being observed :—

(1.) Sow in fifth month (Sĕmai) ; in a nursery.
(2.) Plant out in sixth month (Chĕdung ?).
(3.) Tend and manure it carefully.
(4.) Pick from three to four months later (Pĕtik).

[N.B.—For reasons of magic, the sowing takes place at night, when the enemies of the plant cannot see the seed. So, too, the planting out takes place in the early morning, the young plants being treated like new-born infants, as is the case with the first of the young rice-seedlings.]

After picking the leaves are piled up in a heap (di-pram) for three or four nights with branches over them. This is intended, it is said, to "ripen" them. The riper (*i.e.*, fermented) ones are afterwards selected and shredded on the "Kuda-kuda" with a long sharp knife. The shreds are then deposited upon a bamboo frame (anchak) measuring about 2 hasta (cubits) in length by 1 hasta in width, four or five divisions (tēpek) going to each frame or anchak (usually reckoned at 1 kati). *Late* tobacco is called "sayup." When dry the tobacco is packed in round receptacles made of palm-cloth (upih), which are called ēpak.

The shredding machine is called "Pasong tembakan" or "Kuda-kuda." It consists of a short horizontal wooden trough or channel along which the leaves are pushed until they reach a circular opening in what is called the "mask" or "topeng" of the machine. On reaching this opening the leaves are pushed gradually through it, the protruding part being sliced off in fine strips with a sharp knife. The trough, which is about 3 feet long, is supported on two uprights which fit into wooden blocks.

A specimen of this machine, which was bought in Ligeh, is now in the Cambridge Museum. The shredding knife sometimes has a bent neck or haft ("berk'rēko^{n}k").

V.—WOAD.

(*Isatis tinctoria*, L.)

Enquiries are from time to time addressed to Kew respecting the cultivation of woad. This still continues in the Eastern Counties. The following interesting account of it, by Mr. Francis Darwin, F.R.S., and Professor Meldola, F.R.S., is borrowed from *Nature* (November 12, 1896, pp. 36, 37) :—

"A reference to any old gazetteer under the name Wisbech will show that this town was once an important centre of the English woad industry. It is not generally known, however, that woad is still grown and worked up in a few localities, and it was with some surprise that we learnt that the processes connected with the manufacture might be seen in operation at Parson Drove, near Wisbech, at the present time. There are said to be three other places where the plant is cultivated and worked up for use by dyers—one near Boston and two near Holbeach, in Lincolnshire ; but at these centres the introduction of steam power has destroyed the primitive character of the manufacture. As an interesting survival of the past, the mill at Parson Drove is well worthy of a visit.

"It is hardly to be expected that a feeble tinctorial substance, such as woad, can retain a permanent footing as an English product in view of the circumstance that it has to compete with indigo, as well as with its modern coal-tar substitutes. The thought that this old-time industry, like the potash-making in Essex,* is sooner or later destined to become extinct, has led us to place upon record the information which we gathered during a visit to the Parson Drove mill in July of this year. We may add that descriptions of this mill were given in the *Gardeners' Chronicle* in 1881† and 1882 ; but, as we obtained later and more detailed statements on the spot, concerning the actual operations as now conducted, it may be of interest to chronicle the facts once again while it is still possible to get particulars from the woad-men at first hand.

"The leaves of the plant (*Isatis tinctoria*) are wrenched off at the base by the pickers, the root being left undisturbed, so as to permit the growth of a second crop. The first process consists in crushing the leaves to a pulp under rollers. The latter, of which there are three at the Parson Drove mill, are hollow, slightly conical, wooden drums, with about two dozen iron cross-bars arranged round the circumference, these iron bars furnishing the effective crushing edges. The three rollers are geared to a long projecting horizontal pole, which is made to move round by means of a horse. The pulpy mass resulting from the crushing operation is then kneaded by hand into balls, about the size of cricket-balls, on a wooden stage, the balls, when made, being placed in three rows on wooden trays, which, as they are packed, are pushed up a sloping plank till high enough to go on to the

---

"* See a paper by Henry Laver in the *Essex Naturalist*, vol. ix., p. 119.

"† The writer of this article acknowledges, as the source of his information, a recent paper in the *Friends' Quarterly Examiner*. An interesting popular account of the mill appeared in *Aunt Judy's Annual* volume in 1883."

head of a man who stands at the end to receive them. Each tray, as it is delivered, is carried to the drying sheds. The balls are allowed to dry in the air for about four weeks, and are for this purpose transferred from the trays to wooden gratings arranged in tiers in the roofed, open framework sheds, known locally as 'ranges.' When dry, the balls are again ground up under the rollers, and the material then conveyed to the floor of another roofed shed, where it is sprinkled with water, and allowed to ferment for a period of nine weeks. The shed in which this process goes on is known as the 'couching-house.' The fermenting mass is constantly turned over by the workmen, and water added from time to time. We were told that the fermentation is at first very vigorous, the mass getting quite hot and steaming. At the end of the process in the couching-house the woad is ready for the market, and is simply packed tightly into wooden casks for sending away.

"The primitive character of the manufacture makes it not only of interest as a lingering survival of an ancient rural industry, but the antiquarian and lover of folk-lore may derive instruction from the mode of construction of the rough sheds, and from the technicalities used by the workmen. Thus the term 'couching' is used in a similar sense by maltsters, and is no doubt a Norman survival (Fr. *Coucher*): the sloping plank is called the 'firm' (? form), and the tray on which the pulp is kneaded is known as the 'balling-horse.' The balls were formerly dried on wattles, known as 'fleaks,' a term apparently identical with the word still used for hurdles in Scotland; but these are no longer used at Parson Drove. The central circular shed containing the rollers is built of wooden planks and posts, and thatched with a conical roof; the lateral couching-house is constructed of thick turf walls, with the slabs arranged in a peculiar herring-bone form, and also roofed with thatch. The whole construction was evidently framed with a view to cheapness and simplicity, so as to be easily removable. In the palmy days of the industry the sheds were not permanent erections, but were moved about from one place to another, so as to be near the crops.

"We content ourselves with recording the bare facts without comment or criticism. Any science that lurks behind this ancient manufacture has been found out empirically, and handed down by tradition from a remote past. The imaginative person may indulge his fancy by carrying back the woad industry to that period when the early inhabitants of this country furnished that solitary scrap of personal information which is still the historical stock-in-trade of the average school-boy. It may be well, however, to point out in this connection that *Isatis tinctoria* appears not to be a native of Britain.* We were told that in former times the woad-men were limited to certain families, and that they had traditional chants of their own; but these are passing into oblivion, and we were unable to ascertain the words.† The

---

"* In the 'Flora of the British Islands' (ed. 1870), Hooker says: 'The ancient Britons stained themselves with this plant; later the Saxons imported it.' Can it be that even at that remote period the British colour industry could not hold out against continental competition?

"† A verse is recorded by Miss Peckover in the article in *Aunt Judy's Annual* volume for 1883, p. 549."

object of drying the pulp first, and then wetting it again before allowing it to ferment, is not at first sight obvious, nor could we learn why this practice has been found advantageous. The fermentation itself is no doubt a zymolytic decomposition of glucosides. The use of woad as a source of indigo is now very limited, being confined to some of the old-fashioned Yorkshire dye-houses, where it is used in conjunction with indigo in the so-called 'woad vat,' a description of which will be found in any work on dyeing."

As to the present use of woad in manufactures, Dr. Schunck, F.R.S., has kindly supplied the following note :—

Kersal, Manchester,
August 31, 1897.

I AM not aware that woad is still used *alone* without the addition of indigo. Some years ago, when writing an article on blue dyeing for *Ure's Dictionary*, I went to Yorkshire and studied the process of blue dyeing in one of the first establishments there.

I found they used woad, madder, bran, and caustic lime, in addition to indigo. The woad can add very little to the intensity of the colour, its only use, in my opinion, being to start and keep up the process of fermentation which is necessary in order to dissolve the indigo for dyeing purposes. The process is a ticklish one ; it is subject to one or two mishaps ; the vat may either become too alkaline or too acid. In either case the liquor is spoiled, and the indigo is lost or destroyed. I should think better and simpler processes are now employed.

EDW. SCHUNCK.

Museum No. I. at Kew contains (Case 6) a fine series illustrating the details of the Wisbech factory, including an example of the peculiar iron-tool employed for weeding woad. These were presented in 1881 by A. Peckover, Esq., through Professor Oliver, F.R.S.

VI.—MISCELLANEOUS NOTES.

Visitors during 1901.—The number of persons who visited the Royal Botanic Gardens during the year 1901 was 1,460,169 ; that for 1900 was 1,111,024. The average for 1891–1900 was 1,346,861. The total number on Sundays was 594,371, and on week-days 865,798. The maximum number on any one day was 88,543 on May 27th, and the smallest 35 on December 12th.

The detailed monthly returns are given below :—

January	12,923
February	18,450
March	39,513
April	190,878
May	307,052
June	235,726
July	193,936
August	245,598
September	147,108
October	40,242
November	15,717
December...	13,026

Col. Sir Henry Collett, K.C.B.—This distinguished soldier and enthusiastic botanist died on Dec. 21st of last year on the eve of publication of his *Flora Simlensis*. The Kew Staff did the little that was still necessary, and the Director contributed the following "In Memoriam" :—

I have watched the progress of this work with sympathy and interest. I had not thought that the death of its distinguished author would impose on me the sad task of writing these words to his memory.

Sir Henry Collett was born in 1836 and entered the Bengal Army when he was only nineteen. His military career was one of great distinction. The Commander-in-Chief, Field Marshal Earl Roberts, K.G., V.C., etc., has with great kindness given me the following account of it.

March 1, 1902.

Dear Sir William Thiselton-Dyer,—I was indeed well acquainted with the late Sir Henry Collett, and had a great regard for him. Throughout his military life he was as persevering and thorough as you describe him to be in the preparation of his book on the indigenous plants of Simla.

Sir Henry Collett took a prominent part in several campaigns. As quite a boy he served during the Indian Mutiny. The following year, 1858, he took part in the Sittana Expedition on the N.W. Frontier of India.

Five years later (1862–63) he was with a force employed in the Cossya and Jyntea hills on the S.E. Frontier of India, and received a severe wound in the ankle, which lamed him for life.

In 1867–68 he took part in the Abyssinian Expedition, and it was then, I think, I first made his acquaintance

When the second Afghan war broke out in 1878, I applied for Major (as he then was) Collett to be attached to my column as Assistant Quarter-Master General. He remained with me during the two years the war lasted, and afforded me very valuable assistance. It was from information gained by Major Collett, by means

of a personal reconnaissance he made, that I was enabled to adopt the Spingawi route and thus turn the strong position held by the Afghans on the Peiwar Kotal.

Between the years 1886–90, Colonel Collett served first as Quarter-Master-General in India, then in command of a brigade in Burma, and subsequently in command of the Eastern Frontier District during the Chin-Lushai Expedition. In 1891, Major-General Collett commanded the expedition to Manipur, and acted as Chief Commissioner of Assam.

General Collett was frequently mentioned in despatches, he was thanked by the Government of India for his services in Assam, and before he retired from the Army in 1893, he had the honour of being made a Knight Commander of the Bath.

No one who was acquainted with Sir Henry Collett could fail to appreciate his kindly disposition and charm of manner, as well as his many soldierly qualities. He was one of the few officers in the Army I have met with who was as devoted to science as to his professional duties.

Sir Henry Collett's retirement was a serious loss to the Indian Army, but I rejoice to think that the last years of his life were spent in pursuits which were thoroughly congenial to him, with a result which confirms my high estimate of his application, resolution, and ability.

Believe me,
Yours very truly,
ROBERTS.

For nearly forty years Collett was actively employed in military duties, and mostly in India. From his youth he had a strong taste for scientific studies. It is remarkable that he was able, practically unaided, to prosecute them with such success. Our common friend, Mr. J. S. Gamble, C.I.E., F.R.S., late Director of the Forest School, Dehra Dun, has given me some interesting particulars. He "used to say of himself, that his wound, obtained at an early period of his service, incapacitated him for the games which most soldiers, at any rate young men, delight in." He first took up astronomy and physics. Mr. Gamble continues: "I always used to envy him his power of application and his wonderful capacity of concentrating his attention on a new subject and not resting till he had got to understand it. . . . He had a wonderfully clear power of explaining. . . . When the discoveries of the telephone and microphone etc. were made, he was much interested; and he amused himself by constructing a microphone and sending messages from one end of his house to the other. Often I have spent some hours over it with him, and he was delightfully pleased when he could induce a fly to walk on the drum and listen to its footsteps."

Collett seems to have first become interested in botany in 1878 during the Kuram Valley expedition, perhaps influenced by the late Brigade-Surgeon Aitchison, C.I.E., F.R.S.

The latter wrote: "Early in 1879, I proposed to the Quarter-Master-General, Major Collett, that it might prove advantageous to science if some one were appointed to accompany the column in the contemplated advance on Kabul. General Roberts at once

recommended the proposal to superior authority, which ultimately resulted in my being attached to the force as botanist." The result was embodied in the important paper published in the "Journal of the Linnean Society" (Botany, xviii. pp. 1–113).

Late in 1879 Collett paid a brief visit to England. He wrote to Sir Joseph Hooker on September 16th, apologising for his inability to deliver a letter from Aitchison in person, having "to return immediately in consequence of the news which has been received from Kabul." He adds: "I had not much time when in Kuram for botanical pursuits, but I collected most of the plants which were new to me, and some of them will be forwarded to you."

It was, however, about 1885 that Collett's attention was seriously turned to botanical work. In the summer of that year the Simla Naturalists' Society was founded. Sir Courtenay Ilbert, K.C.S.I., was President, and Collett was an original member. The present work is the fulfilment of a hope expressed by the President in the preface to the first number of the journal that one outcome of its work would be "a handbook such as may be worthy of a district singularly rich in objects of interest to the naturalist, and as may furnish information to be sought in vain in the arid pages of a district manual." The Society has been described as "a small band of ardent naturalists." They no doubt confirmed Collett in his permanent devotion to botany. He contributed his first botanical papers to its journal and is also reported to have delivered to it a lecture on polarised light.

Collett collected assiduously the plants of Simla and formed a herbarium which he used in the preparation of this book. After his death it was given by his family to Kew. In 1887–8 he was in command of a brigade in Burma, and in the Southern Shan States on the little-explored frontier of Upper Burma he found an opportunity of breaking new ground. In A. H. Hildebrand, C.I.E., the superintendent of the Southern Shan States, he found a colleague of tastes sympathetic with his own. Collett says: "I began collecting plants in this region partly to gratify my own love of botany, and partly in response to the request of my friend Dr. (now Sir George) King, K.C.I.E., F.R.S." The results were published in 1890 in the "Journal of the Linnean Society" (Botany, xxviii. pp. 1–150). No fewer than 725 species of flowering plants were enumerated. These were worked out at Kew and published under the joint names of Collett and W. B. Hemsley. The collection included two of the most remarkable plants ever introduced into European gardens. Both are remarkable for the size of their flowers: *Rosa gigantea* is the largest single-flowered rose known, it is described as having flowers 5–6 inches in diameter; it climbs to the top of the tallest trees, and Collett is said to have detected it at the distance of two miles by means of a field-glass; *Lonicera hildebrandiana* is a honeysuckle with flowers seven inches long; it was named in honour of his friend who "kindly gave much assistance in collecting," and who, after an infinity of trouble, ultimately succeeded in transmitting living seeds to Kew. In 1889 Collett had himself sent to Kew living plants of two extremely remarkable orchids which he had discovered, *Bulbophyllum racemosum* and *Cirrhopetalum Collettii*.

After 1889 Collett's hands were pretty full of serious military and administrative duties. I heard nothing from him till after his retirement in 1893. Even then it is an open secret that high professional advancement was still within his reach. But he had begun to be afflicted with deafness, and as he told me in after years he thought no one with that infirmity was justified in assuming high military command.

He eventually settled in London, and it must have been early in 1895 that he came to consult me about his projected "Flora of Simla." He had a good practical knowledge of it in the field, and his first idea was that he might make a sort of rough draft and that some member of my staff might put it into a proper technical shape. I pointed out to him that such a collaboration would be in no way satisfactory, that the merit of the book would be the personal impress that he would give to it himself, and that I should not be inclined to aid the undertaking unless he undertook it single-handed. Collett pleaded his want of technical knowledge, but the real obstacle was only his excessive modesty. He was a little shy of coming to work amongst us with only the equipment of the amateur, and though possessed of indomitable pluck was diffident as to the result. I assured him that it was merely a question of learning the grammar of an unfamiliar language; that it might be an irksome task for a few weeks, but that he would soon acquire the necessary facility and that he would then feel a new interest in the prosecution of his work. I promised him that his path should be smoothed by the willing assistance of my staff, and he agreed with some demur to make the attempt. I call to mind no similar case of a man late in life, after a course of exceptional distinction, quietly taking the position of a pupil in another field. But the wisdom of my advice was abundantly justified. Collett stuck to his task with bulldog tenacity occasionally relieved by a groan. But he soon mastered his difficulties and became the severest critic of his own work, the early portions of which he entirely rewrote. For several succeeding years he worked at Kew with the greatest regularity, spending the best part of the day in the Herbarium and ending with a walk in the gardens, where I was often amused to find that the habit of the old Quarter-Master General had not been lost and that nothing escaped his observant eye.

Some failure of his health probably took place, though so imperceptibly as to escape observation. The old military fire was roused by the outbreak of the South African war, which he followed with absorbing attention. His first estimates of its course were extravagantly optimistic, to be followed by others equally pessimistic. With no military knowledge but some conception of the conditions, I ventured to differ from him in both respects. But the war weighed heavily on him, and he told me he could not sleep at night for thinking of it and its consequences. He had, however, almost completed the manuscript of his book, and commenced printing. He then took a holiday in Ireland with Mr. Gamble. It is possible that he over-fatigued himself. On his return he had some kind of sudden seizure, and for some time he was in a precarious state, but slowly recovered. He then came to see me at Kew, and though he was obviously very much broken I did not feel any immediate anxiety about

him. But he had repeated failure of the heart's action, and to this he eventually succumbed. He spent his life strenuously and with distinction in the service of his country and in the interests of science, and the end came with the simple exhaustion of his physical powers.

Almost his last inquiry was as to the progress of his book. This fortunately had been left in a state which enabled Mr. W. B. Hemsley, F.R.S., the Keeper of the Herbarium, to see it through the press with little difficulty. I think Collett felt no real anxiety as to its fate. He hoped that it would stimulate an interest in a subject which he himself had found a pleasant recreation in the midst of official duties. Those who use it will speedily discover that it is no mere compilation, but the outcome of conscientious and independent work. Collett had the true scientific temperament. He had no respect for scientific authority and distrusted textbooks. He was never content without verifying the facts for himself. He described his plants fresh from the field, and at once entered in his notebooks copious memoranda and excellent drawings, and these he constantly used in working up his material at Kew.

At first sight there may seem something anomalous in a distinguished soldier devoting his years of retirement to botanical studies, still more perhaps in prosecuting them in the midst of his professional duties. As a matter of fact, the obligations of botanical science to the Army are very great; it is sufficient to recall the names so familiar to botanists of the late General Munro, C.B.; of the late Colonel Grant, C.B., C.S.I., and of Lieutenant-General Sir Richard Strachey, G.C.S.I. The flora of Tibet would be hardly known to us but for the collections made by military officers, of whom Captain Deasy, the late Captain Wellby and Captain Malcolm, D.S.O., may more particularly be mentioned. Nor is it easy to estimate the position our knowledge of the Indian flora would occupy without the labours of a long series of officers of the Indian Medical Department. And among Russian officers the name of General Przewalski will always stand out pre-eminent for his botanical work in Western Asia. The fact is that the qualities that make for success both in the soldier and the botanist are largely identical: they are quick observation and the power of rapidly drawing correct observations from minute facts. When Collett discovered his giant rose through his field-glass he was using his eyes and his reasoning powers precisely as he would have done in a military reconnaissance.

Collett's personality had something wholly out of the common. Rather below the average height he had a spare, erect and well-knit figure. A bright, frank and alert expression was accompanied by a singular charm of manner. In many ways he constantly reminded me of the late General Gordon. And as with him a keen glance would sometimes flash from the eyes which showed that stern resolution would not be wanting on occasion. There was nothing about him of the *beau sabreur*, but he had all the impress of a man destined to lead and command. As with most distinguished soldiers, his address was singularly modest and simple; at the same time he held decided views on most subjects and with extreme tenacity, though rarely caring to give expression

to them. Nor did he ever refer to his past career. In fact, I never induced him to talk about it except in the case of the Manipur expedition, on which on merely geographical grounds I asked for information. He was not a copious correspondent, and his letters were always strictly to the point and expressed with soldierly terseness.

Mr. Gamble, himself a botanist of distinction, who had long worked with him in India, sums up his estimate of Collett's powers in words with which from my own experience I entirely concur : —

" I am convinced that if Collett had been a professional botanist he would have made a great name for himself; and it is possible that had he been spared, his work, supported by his knowledge of the world, his wide reading and by his distrust of anything he could not personally verify, would have been more original and so perhaps more valuable. He was quite undaunted ; he talked of taking up the Simla mosses when his Phanerogamic Flora should be published ! "

I devote these words to the memory of my friend. I will but add this : no one who has ever come to work amongst us at Kew has more completely won the affectionate regard of everyone with whom he has come in contact.

W. T. THISELTON-DYER.

Kew, 1902.

Mr. THOMAS WILLIAM BROWN, formerly a member of the gardening staff of the Royal Botanic Gardens, who recently retired from the post of Assistant Curator of the Botanic Station, Aburi, Gold Coast, on the ground of ill-health, has been engaged to lay out the gardens of the Sultan of Morocco at Fez.

Mr. JOHN ERSKINE LESLIE, a member of the gardening staff of the Royal Botanic Gardens, has been appointed on the recommendation of Kew, by the Secretary of State for India in Council, a probationer gardener for employment in the Royal Botanic Gardens, Calcutta.

Mr. WALTER CHARLES FISHLOCK, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for the Colonies, Agricultural Instructor in the Virgin Islands.

Mr. ALEXANDER HISLOP, a member of the gardening staff of the Royal Botanic Gardens, has been appointed Assistant Superintendent of the Municipal Gardens, Queenstown, Cape Colony.

Mr. MORLEY THOMAS DAWE, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for Foreign Affairs, Assistant in the Scientific Department, Uganda.

Mr. ERNEST LONG, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for India in Council, a probationer gardener for employment in the Royal Botanic Gardens, Calcutta.

Mr. FRANK GARRETT, left the service of Kew where he had held the post of Decorative Foreman for over sixteen years, on Oct. 31st, to take that of Head Gardener to the Duke of Marlborough at Blenheim. He is succeeded by Mr. A. Osborn, sub-foreman in the Ferneries.

Research in Jodrell Laboratory in 1902 :—

Boodle, L. A.—On Lignification in the Phloem of *Helianthus annuus*. (Ann. Bot., Vol. XVI., pp. 180–3.)

Brebner, G.—On the Anatomy of *Danaea* and other Marattiaceae. (Ann. Bot., Vol. XVI., pp. 517-52, tt. 22 and 23.)

Brown, H. T., and Escombe, F.—The Influence of varying Amounts of Carbon Dioxide in the Air on the photosynthetic Process of Leaves and on the Mode of Growth of Plants. (Proc. Roy. Soc., Vol. 70, pp. 397–413, tt. 5–10.)

Fritsch, F. E.—The Affinities and Anatomical Characters of *Plagiopteron fragrans*, Griff. (Ann. Bot., Vol. XVI., pp. 177–80.)

Fritsch, F. E.—Algological Notes I., II., and III. Observations on Species of *Aphanochaete*, Braun. (Ann. Bot., Vol. XVI., pp. 403–412, with 1 Fig. in text.)

The Germination of the Zoospores in *Oedogonium*. (Ann. Bot., Vol. XVI., pp. 412–417, with 1 Fig. in text.)

Preliminary Report on the Phytoplankton of the Thames. (Ann. Bot., Vol. XVI., pp. 576–84.)

Fritsch, F. E.—The Structure and Development of the young Plants in *Oedogonium*. (Ann. Bot., Vol. XVI., pp. 467–485, with 3 Figs. in text.)

Massee, G.—Larch and Spruce Fir Canker. (Journ. of Board of Agriculture, September, 1902, reprint, pp. 1–15, tt. 1–3.)

Massee, G., and Salmon, E. S.—Researches on Coprophilous Fungi. II. (Ann. Bot., Vol. XVI., pp. 57–93, tt. 4 and 5.)

Salmon, E. S.—On the Increase in Europe of the American Gooseberry-Mildew. (Journ. Roy. Hort. Soc., Vol. XXVII., reprint, pp. 1–6, with 1 Fig. in text.)

Scott, D. H.—On the primary Structure of certain Palaeozoic Stems with the *Dadoxylon* type of Wood. (Trans. Roy. Soc. Edinburgh, Vol. XL., Part II., pp. 331–365, tt. 1–6, with 3 Figs. in text.)

Worsdell, W. C.—The Nature of the Vascular System of the Stem in certain Dicotyledonous Orders. (Ann. Bot., Vol. XVI., pp. 599–600.)

INDEX.

Appointments, 23.
Aralia quinquefolia, 4.
— — var. angustifolia, 7.
— — — Ginseng, 6.
— — — major, 7.
— — — notoginseng, 7.
— — — pseudo-Ginseng, 7.
— — — repens, 6.

Brown, T. W., 23.

China, Ginseng in, 4.
Collett, Sir Henry, 18.

Dawe, M. T., 24.

Fishlock, W C., 23.
Flora Simlensis, 18.
Fodder-grass, American, 1.

Garrett, F., 24.
Ginseng in China, 4.

Hislop, A., 23.

Isatis tinctoria, 15.

Jodrell Laboratory, research in, 1902, 24.

Kew, Library catalogue, supplement to, Appendix II.
— Visitors during 1901, 17.
Khasia Patchouli, 11.

Leslie, J. E., 23.
Long, E., 24.

Microtaena cymosa, with plate, 11.
Miscellaneous Notes, 17.

New garden plants of 1901, Appendix III.

Paspalum dilatatum, 1.
Patchouli, Khasia, 11.

Seeds available for exchange, Appendix I.
Siam, Tobacco cultivation in, 12.
Staffs of botanical departments at home and abroad, Appendix IV.

Tobacco cultivation in Southern Siam, 12.

Visitors during 1901, 17.

Woad, 16.